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<p>There was a lot of excellent science presented and all the participants learned a lot. A principle goal of the conference was accomplished, which is extremely relevant to the AFSOR mission. As stated in the original proposal to AFOSR, we brought together top people in academic research condensed matter dynamics community, with experts in shock waves and energetic materials. For example, Marvin Ross (LLNL), Yogi Gupta (Washington State), James Belak (LLNL), and Craig Tarver (LLNL) talked about shock waves and initiationphenomena, introducing the most interesting and relevant results in these fields to the academic scientists. A high point of the meeting was Prof. Suslick's talk about material synthesis using shock wave via sonochemistry. Many of the academic scientists commented to me how interesting were the problems in these fields and how nice an introduction the meeting proved to be. They are keenly interested in the possibilities of making a practical impact with their theoretical models and technologies. Conversely, the shock people were extremely pleased to be provided an introduction to the state of the art in condensed matter dynamics.</p>			
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**1996 FINAL REPORT**

**submitted to**

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AFOSR/NL  
110 Duncan Avenue, Suite B115  
Bolling AFB, DC 20332-0001**

**"FOURTH CONFERENCE ON MOLECULAR REACTION DYNAMICS IN  
CONDENSED MATTER"**

**Principal Investigator:** Charles A. Wight  
Professor of Chemistry

**Institution:** University of Utah  
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**Grant Number:** F49620-96-1-0010

**Period Covered:** 15OCT95 through 14OCT96

17 OCT 1996

## SUMMARY

The conference was a big success. The site was beautiful and everything was well managed. More than 40 scientists attended. Everybody worked very hard because the sessions ran all day and half the night, which let us present a large amount of material in a short time frame. The talks were without exception exciting and stimulating, and discussion persisted late into the night. A copy of the program with all the titles of the presentations is included.

There was a lot of excellent science presented and all the participants learned a lot. A principle goal of the conference was accomplished, which is extremely relevant to the AFOSR mission. As stated in the original proposal to AFOSR, we brought together top people in academic research condensed matter dynamics community, with experts in shock waves and energetic materials. For example, Marvin Ross (LLNL), Yogi Gupta (Washington State), James Belak (LLNL), and Craig Tarver (LLNL) talked about shock waves and initiation phenomena, introducing the most interesting and relevant results in these fields to the academic scientists. A high point of the meeting was Prof. Suslick's talk about material synthesis using shock waves via sonochemistry. Many of the academic scientists commented to me how interesting were the problems in these fields and how nice an introduction the meeting proved to be. They are keenly interested in the possibilities of making a practical impact with their theoretical models and technologies. Conversely, the shock people were extremely pleased to be provided an introduction to the state of the art in condensed matter dynamics.

A particularly exciting feature of the conference was the opportunities for participation by younger scientists, postdocs and students. We provided fellowships for approximately 12 young people to attend. Six of them were from UC Irvine, in Benny Gerber's and Ara Apkarian's group. They were provided with conference registration only. The other six were from Illinois, Utah, Princeton, Rochester, Stanford, and Virginia. They were provided with conference registration, local expenses and partial travel support. All student fellowships were awarded on a competitive basis, using recommendation letters from the students' advisors, publication record, and subject material provided by the applicants. Eight of the talks were given by students and postdocs. The "Gordon Conference" style of the meeting let these students meet and dine with the more established participants in a comfortable and informal atmosphere in a manner rarely possible at conventional meetings. All the feedback I received showed the students' talks were exceptionally interesting and well prepared. We have sponsored a group of extremely talented young people who all have great futures in science.

Except for a small amount targeted for administrative costs (mailing, secretarial, etc.,) the funding provided by AFOSR was used to directly cover costs of running the meeting (reimburse participant costs and pay the Balboa Bay Club for use of its facilities). AFOSR support was acknowledged verbally at the meeting, in the published program, and along with travel reimbursements.

# **FOURTH SYMPOSIUM ON MOLECULAR REACTION DYNAMICS IN CONDENSED MATTER**

Newport Beach, CA

Program Chairs: C. Wight (Utah) and D. Dlott (Illinois)

Program sponsors: Air Force Office of Scientific Research, Army Research Office,  
Office of Naval Research

**Wednesday, Feb. 7**

## Arrival and check in

**8:00 - 10:00 pm**      *Condensed phase dynamics I-- chair C. Wight*

8:00	Prof. Ara Apkarian	U. C. Irvine	Dynamical Spectroscopy of Many-Body Interactions
9:00	Prof. Michael D. Fayer	Stanford University	Vibrational Photon Echo Studies of Liquids, Glasses, and Proteins

**Thursday, Feb. 8**

7:30 - 8:50 am Breakfast

8:50 -12:00 noon      *Shock waves and high pressure I* --Chair M. D. Fayer

8:50	Prof. Y. Gupta	Washington State University	Shock-induced chemical reactions in high explosives
9:40	Dr. Marvin Ross	Lawrence Livermore	Physical chemistry of shock-compressed liquids
10:30	Break		
10:50	Jens Franken	University of Illinois	Ultrafast coherent Raman Spectroscopy of Shocked Energetic Materials
11:10	Prof. Kenneth Suslick	University of Illinois	The Cavitation Hot Spot

12:00 -2:00 pm                      Lunch

2:00 -6:00 pm                      *Surface Dynamics* --chair J. Kauffman

2:00	Prof. Paul Barbara	University of Minnesota	Spatially and Temporally Resolved Spectroscopy of Molecular Crystals and Aggregates
2:50	Prof. Paul Hansma	UC Santa Barbara	Observing the motion of individual protein molecules
3:40	Break		
4:00	Dr. Jay Trautman	AT&T Bell Labs	Time Resolved Spectroscopy of Single Molecules
4:50	John Higgins	Princeton University	Excited State Chemical Reactions of High-spin Alkali Trimers on the Surface of Helium Clusters
5:10	Prof. Charles Harris	UC Berkeley	Femtosecond studies of electrons on surfaces and at interfaces

6:00 - 8:00 pm                      Dinner

8:00 - 10:00 pm                      *Condensed Phase Dynamics II*--Chair Ara Apkarian

8:00	Prof. Robin Hochstrasser	University of Pennsylvania	Energy and coherence relaxation of highly excited diatomic molecules in liquids
9:00	Prof. James Skinner	University of Wisconsin	Vibrational relaxation in Liquids

Friday, Feb. 9

7:30 - 9:00 am

Breakfast

9:00 -12:00 noon

*Condensed Phase Dynamics III*--chair Eric Chronister

9:00	Prof. Thomas Brill	University of Delaware	Spectroscopy, Kinetics and Mechanisms of Hydrothermal Reactions
9:50	Prof. John Kauffman	University of Missouri	Rotational relaxation and kinetics of diphenyl polyenes in the compressible region of CO <sub>2</sub>
10:10	Break		
10:30	Kevin Gunde	University of Virginia	Dynamics of Chirality-dependent Intermolecular Energy Transfer in Solution
10:50	Prof. Herb Strauss	UC Berkeley	Vibrational Energy Transfer in Hydrogen-Bonded Crystals by Spectral Hole Burning
11:40	Tatanya Smirnova	University of Illinois	Measurements of Picosecond Rotational Dynamics in Liquids by EPR at 95 GHz

12:00 -2:00 pm

Lunch

2:00 -6:00 pm

*Condensed Phase dynamics IV*--Chair J. Michael Brown

2:00	Prof. Keith Nelson	MIT	Single-pulse and multiple-pulse femtosecond spectroscopy of solids
2:50	Dr. Craig Tarver	Lawrence Livermore National Laboratory	Shock-induced detonation
3:10	Break		
3:30	Dr. Jeffrey Hill	University of Illinois	Vibrational Relaxation at the Active Sites of Myoglobin, its Mutants and Model Heme Compounds
3:50	Kristin Weidemaier	Stanford University	Solvent Structure and Hy-

			drodynamic Effects in Intermolecular Photoinduced Electron Transfer: Theory and Experiment
4:10	Prof. Craig Martens	UC Irvine	Ultrafast Dynamics in Solids
5:00	Alexander V. Benderskii	University of Utah	Influence of solid state environment on conformational isomerization kinetics
5:20	Dr. Alan Johnson	University of Rochester	Observation of solvent phonons in resonance Raman spectroscopy
5:40	Dr. Leonardo Martinez	UC Davis	Characterization of Solvent Clusters in a Supercritical Lennard Jones Fluid

8:00 - 10:00 pm *Clusters*

8:00	Prof. Benny Gerber	U. C. Irvine	Dynamics of Photodissociation and Recombination in Clusters and in Solids
9:00	Prof. Carl Lineberger	University of Colorado	Dynamics of Energy transfer in Size Selected Cluster Ions: A View from the Perspective of the Solvent

Saturday, Feb. 10

7:30 - 8:50 am Breakfast

8:50 - 12:00 noon *Shock waves and high pressure II--Chair Dana Dlott*

8:50	Prof. J. Michael Brown	University of Washington	Impulsive stimulated scattering studies of molecular solids, fluids and solutions at high pressure
9:40	Prof. Eric Chronister	UC Riverside	Vibrational dynamics in molecular solids under high pressure
10:30	Break		
10:50	Dr. James Belak	Lawrence Livermore	Effects of voids and defects on shock induced energy transfer in molecular crystal
11:40	Dr. Mike McQuaid	US Army Research Lab	Spectroscopic investigation of shock-loaded XM46

12:00 noon *Conference ends*

**Fourth Symposium on Molecular Reaction Dynamics  
in Condensed Matter**

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